CLAIMS

What is claimed is:

1. A method of determining a resistivity parameter of an earth formation using a logging tool within a borehole penetrating said earth formation, the method comprising:

(a) obtaining a plurality of first measurements with a resistivity sensor on the logging tool indicative of said parameter of interest at a plurality of rotational positions of the logging tool, said resistivity sensor having a substantially uniform azimuthal response characteristic; and

(b) determining said resistivity parameter from measurements made by said resistivity sensor at a position that is not at the center of said borehole.

2. The method of claim 1 further comprising:

(i) making second measurements with an orientation sensor indicative of a toolface angle of said logging tool at said plurality of rotational positions;

(ii) using at least one additional sensor to make third measurements indicative of said position of said logging tool relative to the center of said borehole at said plurality of rotational positions; and

(iii) determining from said second and third measurements said position of said reisistivity sensor.

3. The method of claim 2 wherein said orientation sensor comprises a magnetometer.

4. The method of claim 3 wherein said magnetometer comprises a two-component magnetometer.

5. The method of claim 2 wherein said at least one additional sensor comprises two additional sensors.

6. The method of claim 5 wherein said at least two additional sensors comprise an x- and a y- component accelerometer.

7. The method of claim 2 wherein determining said position further comprises determining expected values of said third measurements at said plurality of rotational positions using said second measurements.

8. The method of claim 7 wherein determining said position further comprises determining differences between said third measurements and said expected values.

9. The method of claim 8 wherein determining said position further comprises performing an integration of said differences.

10. The method of claim 9 wherein said integration further comprises a double integration.

11. The method of claim 9 further comprising using a constraint for said double integration.

12. The method of claim 11 wherein said constraint is based on a dimension of said borehole.

13. The method of claim 11 wherein said constraint is based on a measurement made by a standoff sensor.

14. The method of claim 1 wherein said resistivity parameter comprises at least one of (i) a position of a bed boundary in said earth formation, and, (ii) an orientation of a bed boundary in said formation.

15. The method of claim 14 wherein determining said resistivity parameter further comprises defining a region in said earth formation to which said resistivity sensor is responsive independent of said position of said logging tool.

16. The method of claim 7 wherein determining said expected values further comprises using a sinusoidal curve fitting.

17. A measurement-while-drilling (MWD) tool for determining a resistivity parameter of an earth formation comprising:

(a) a resistivity sensor having a substantially azimuthally uniform response function for making first measurements indicative of said parameter of interest at a plurality of rotational positions of the MWD tool;

(b) an orientation sensor for making second measurements indicative of a toolface angle of said MWD tool at said plurality of rotational positions;

(c) at least one additional sensor for making third measurements indicative of a position of said logging tool relative to a center of said borehole at said plurality of rotational positions; and

(d) a processor for determining from said second and said third measurements said position of said logging tool.

18. The MWD tool of claim 17 wherein said orientation sensor comprises a magnetometer.

19. The MWD tool of claim 18 wherein said magnetometer comprises a two-component magnetometer.

20. The MWD tool of claim 17 wherein said at least one additional sensor comprises an *x*- and a *y*- component accelerometer.

21. The MWD tool of claim 17 wherein said processor further determines expected values of said third measurements at said plurality of rotational positions using said second measurements.

22. The MWD tool of claim 21 wherein said processor further determines said position by determining differences of said third measurements from said expected values.

23. The MWD tool of claim 22 wherein said processor further performs a double integration of said differences..

24. The MWD tool of claim 17 further comprising a standoff sensor for determining an offset of the tool from a borehole wall.

25. The MWD tool of claim 17 wherein said processor determines said resistivity parameter based on said determined position.

26. The MWD tool of claim 25 wherein said resistivity parameter comprises at least one of (i) a position of a bed boundary in said earth formation, and, (ii) an orientation of a bed boundary in said formation.

27. The MWD tool of claim 25 wherein said processor further determines a region in said earth formation to which said resistivity sensor is responsive independent of said position of said logging tool.

28. A system for determining a resistivity parameter of an earth formation comprising:

(a) a bottom hole assembly (BHA) including a device for penetrating said earth formation;

(b) a conveyance device for conveying said BHA into said earth formation;

(c) a resistivity sensor on said BHA having a substantially azimuthally uniform response function for making first measurements indicative of said parameter of interest at a plurality of rotational positions of the BHA;

(b) an orientation sensor on said BHA for making second measurements indicative of a toolface angle of said BHA at said plurality of rotational positions;

(c) at least one additional sensor on said BHA for making third measurements indicative of a position of said logging tool relative to a center of said borehole at said plurality of rotational positions; and

(d) a processor on said BHA for determining from said second and said third measurements said resistivity parameter.

29. The system of claim 28 wherein said orientation sensor comprises a two-component magnetometer.

30. The system of claim 29 wherein said at least one additional sensor comprises an x- and a y- component accelerometer.

31. The system of claim 28 wherein said processor further determines expected values of said third measurements at said plurality of rotational positions using said second measurements.

32. The system of claim 31 wherein said processor further determines said position by determining differences of said third measurements from said expected values.

33. The system of claim 32 wherein said processor further performs a double integration of said differences.

34. The system of claim 28 wherein said processor determines said resistivity parameter based on said determined position.

35. The system of claim 34 wherein said resistivity parameter comprises at least one of (i) a position of a bed boundary in said earth formation, and, (ii) an orientation of a bed boundary in said formation.

36. The system of claim 28 wherein said conveyance device comprises a drillstring.

37. The system of claim wherein said device for penetrating said earth formation comprises a drillbit.